This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) An integrated interferometric microscopic inspection system for inspecting semiconductor wafers, the system comprising:

an illumination module configured to generate a first illumination beam for interferometric inspection in a first mode and a second illumination beam for intensity based microscopic inspection in a second mode;

an integrated interferometric microscope module configured for both inteferometric and intensity based microscopic inspection, in the interferometric inspection mode for splitting the first illumination beam into a test beam directed to the semiconductor wafer and a reference beam towards a reference mirror, and combining the test beam reflected from the wafer and the reference beam reflected from the reference mirror to form an interference image and to reflect the second illumination beam from the wafer; ~~and~~

at least one image sensor configured to receive the interference image and the reflected second illumination beam from the integrated interferometric microscope module; and

a processing module configured to:

reconstruct complex field information from the interference image of a first portion of the wafer;

generate a first signal representation of the first portion of the wafer using the reconstructed complex field information;

measure an intensity of the second illumination beam reflected from the first portion of the wafer using microscopic techniques to generate a third signal representation;

compare the first signal representation and the third signal representation to a second signal representation of a wafer to generate a resultant signal representation; and

use the resultant signal representation to identify defects in the first portion of the wafer.

2-3. (cancelled)

4. (original) The inspection system of claim 1, wherein the reference mirror is tilted with respect to the incident reference beam to generate fringes in the interference image.

5. (original) The inspection system of claim 1, wherein the illumination module is configured to switch between the first illumination beam and the second illumination beam.

6. (original) The inspection system of claim 1, further comprising a shutter to isolate the reference mirror from the optical path of the reference beam.

7. (original) The inspection system of claim 1, wherein the image sensor is configured in a frame capture mode to acquire inspection signals for phase based inspections using a spatial fringe analysis technique.

8. (currently amended) The inspection system of claim 1, wherein the image sensor is configured in a time delay integration mode to acquire inspection signals for phase based inspection ~~using a spatial fringe analysis technique~~ and wherein the phase based inspection analyzes spatial fringes formed on the image sensor.

9. (original) The inspection system of claim 8, wherein the image sensor is configured in a frame capture mode for phase based inspection and time delay integration mode for intensity based inspection.

10. (currently amended) The inspection system of claim 8, further comprising an adjustment mechanism configured to adjust the reference mirror along the axis of the reference beam incident upon the reference mirror to maintain the positioning of ~~the~~ spatial fringe lines on the sensor relative to structures in the image on the sensor.

11. (original) The inspection system of claim 1, further comprising a switching mechanism for switching the operation of the inspection system between interferometric measurement and microscopic measurement.

12. (currently amended) The inspection system of claim ~~1~~ 11, wherein the switching mechanism comprises a switchable shutter located in the incident reference beam path to the reference mirror and a switchable illumination source.

13. (currently amended) The inspection system of claim 8, further comprising a stage to provide movement of the semiconductor wafer in at least one direction, and wherein ~~the~~ spatial fringes on the sensor are aligned with the direction of movement of the stage.

14. (currently amended) A method for inspecting a wafer using interferometric and intensity based microscopic techniques, the method comprising:

combining a test wave reflected from a first portion of a wafer and a reference wave reflected from a reference mirror to produce on an image sensor an interference optical image;

reconstructing complex field information for the first portion from the interference optical image;

generating a first signal representation of the first portion of the wafer using the reconstructed complex field information;

measuring ~~the~~ an intensity of a test wave reflected from ~~a second~~ the first portion of the wafer using microscopic techniques to generate a third signal representation; ~~and~~

comparing the first signal representation and the third signal representation to a second signal representation ~~of~~ obtained from a reference wafer portion to generate a resultant signal representation~~,~~;

using ~~wherein~~ the resultant signal representation ~~is used~~ to identify defects in the first portion of the wafer.

15. (original) The method for inspecting a wafer recited in claim 14, wherein the second signal representation corresponds to a design database file.

16. (original) The method for inspecting a wafer recited in claim 14, wherein the image sensor is configured in a frame capture mode to acquire measurement signals for phase based measurements using a spatial fringe analysis technique.

17. (currently amended) The method for inspecting a wafer recited in claim 14, wherein the image sensor is configured in a time delay ~~intregration~~ integration mode for phase based measurement and wherein the phase based measurement analyzes spatial fringes formed on the sensor.

18. (currently amended) The method for inspecting a wafer recited in claim 14, wherein an adjustment mechanism is configured to adjust the reference mirror along the axis of the reference beam incident upon the reference mirror to maintain the positioning of ~~the~~ spatial fringe lines on the sensor relative to structures in the image on the sensor.

19. (currently amended) The method for inspecting a wafer recited in claim ~~14~~ 18, wherein the maintenance of the positioning of the spatial fringe lines occurs in response to movement of the semiconductor wafer by a stage.

20. (currently amended) A method for performing interferometric inspection, comprising:

directing an illumination beam through an interferometric microscope to a semiconductor wafer, the illumination beam being split into a test beam and a reference beam in the interferometric microscope; ~~and~~

combining the reference beam reflected from a reference mirror and the test beam reflected from the wafer to generate an interference image having spatial fringes on a time delay integration mode sensor, wherein the reference mirror is adjustably tilted so as to maintain a constant optical path difference between the test beam and the reference beam for a selected portion of the interference image pertaining to a corresponding portion of the wafer.

21. (original) The method for performing interferometric inspection as recited in claim 20, further comprising moving a stage supporting the wafer and synchronizing the movement of the stage with the movement of the interference image on the sensor.

22. (original) The method for performing interferometric inspection as recited in claim 21, wherein synchronizing the movement of the stage with the movement of the interference image comprises controlling the movement of the interference image relative to the sensor by adjusting the movement of the reference mirror in the direction of the axis of the reference beam incident upon the reference mirror.

23. (original) The method for performing interferometric inspection as recited in claim 22, wherein the movement of the reference mirror is adjusted to maintain, as the wafer is moved by the stage, a constant optical path difference between the test beam and the reference beam for a selected portion of the interference image pertaining to a corresponding portion of the wafer.

24. (original) The method for performing interferometric inspection as recited in claim 20, further comprising moving a stage supporting the wafer to induce movement of the interference image relative to the sensor, wherein the spatial fringes are oriented on the sensor so that the spatial fringe lines are aligned in the direction of the induced movement.

25. (original) The method for performing interferometric inspection as recited in claim 20, wherein the image sensor is configured in a time domain integrated mode for both phase based and intensity based measurement.

26. (currently amended) An interferometric inspection apparatus comprising:

an illumination module configured to generate a first illumination beam for interferometric inspection ;

an interferometric microscope configured to split the illumination beam into a test beam and a reference beam respectively directed to and reflected from a wafer and a reference mirror and to combine the test and reference beams into an interference image having spatial fringe patterns; ~~and~~

at least one time delay integration mode sensor configured to receive the interference image~~.~~;

a movable stage to support the wafer and to induce movement of the interference image relative to the sensor, and

a processing module operable to induce movement with the movable stage so as to align the spatial fringes on the sensor in the direction of the induced movement.

27. (original) The interferometric inspection apparatus as recited in claim 26, further comprising a movable stage to support the wafer and wherein the apparatus is configured to control the movement of the interference image relative to the sensor by adjusting the movement of the reference mirror in the direction of the axis of the reference beam incident upon the reference mirror.

28. (original) The interferometric inspection apparatus as recited in claim 26, further comprising a movable stage to support the wafer and wherein the apparatus is configured to synchronize the movement of the stage with the movement of the interference image on the sensor.

29. (cancelled)

30. (currently amended) An interferometric inspection system for inspecting semiconductor wafers, the system comprising:

an interferometric microscope module configured for splitting ~~the~~ an illumination beam into a test beam directed to the semiconductor wafer and a reference beam towards a reference mirror, and combining into a combined beam the test beam reflected from the wafer and the reference beam reflected from the reference mirror, the combined beam forming an interference image, wherein the reference mirror is configured to be adjustably tilted with respect to the incident reference beam to generate fringes in the interference image having an orientation different from a dominant direction of a repeating pattern on the wafer; and

an image sensor configured to receive the interference image and to generate a signal for deriving phase information~~.~~

31. (original) The interferometric inspection system as recited in claim 30, wherein the pattern on the wafer is a repeating pattern having a dominant direction and the orientation of the fringes relative to the dominant direction is optimized.

32. (original) The interferometric inspection system as recited in claim 31, wherein the repeating pattern has two dominant directions which are orthogonal to each other and the orientation of the fringes is adjusted to about a 45 degree angle relative to one of two orthogonal directions of the repeating pattern.

33. (currently amended) A method for performing interferometric inspection comprising:

directing an illumination beam to an interferometric microscope, the illumination beam being split into a test beam and a reference beam in the interferometric microscope, the test beam being reflected from a semiconductor wafer and the reference beam reflected from a reference mirror; and

combining the reference beam reflected from a reference mirror and the test beam reflected from the wafer to generate an interference image having spatial fringes on a time delay integration mode sensor, wherein the reference mirror is adjusted with respect to the incident reference beam to generate fringes in the interference image having an orientation different from a dominant direction of a repeating pattern on the wafer.

34. (original) The method for performing interferometric inspection as recited in claim 33, wherein the pattern on the wafer is a repeating pattern having a dominant direction and the orientation of the fringes relative to the dominant direction is optimized.

35. (original) The method for performing interferometric inspection as recited in claim 33, wherein the repeating pattern has two dominant directions which are orthogonal to each other and the orientation of the fringes is adjusted to about a 45 degree angle relative to one of two orthogonal directions of the repeating pattern.

36-47. (cancelled)